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ABSTRACT

This report describes the general goal of the Del Mod System as the coordination of all segments of science and mathematics teacher education in the state, and in the long run all teaching in the state, so that a maximum impact can be made in reaching all students from pre-elementary through doctoral level. The specific objectives are listed as follows: change in teacher and student attitudes and education over a 5-year period as a result of research, pilot projects and pre- and in-service training, and the incorporation of science and math teachers of mathematical functions into daily classroom practices. Included in this report are tables, charts, project summaries, and evaluation charts of the system. Additional material is available in the local collection of Clearinghouse. (JA)

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# THE DEL MOD SYSTEM

AN ENTRY FOR THE

AMERICAN ASSOCIATION OF COLLEGES FOR TEACHER EDUCATION

DISTINGUISHED ACHIEVEMENT AWARDS PROGRAM

SUBMITTED BY

THE UNIVERSITY OF DELAWARE

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
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PREPARED BY

ROBERT L. UFFELMAN, COORDINATOR

DEL MOD SYSTEM PROJECT

SP 006 418

NOVEMBER 1972

THE DELAWARE MODEL: A SYSTEMS APPROACH TO SCIENCE EDUCATION

(DEL MOD SYSTEM)

UNIVERSITY OF DELAWARE

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DEAN, COLLEGE OF EDUCATION

Daniel C. Neale

DELAWARE STATE COLLEGE

PRESIDENT

Luna I. Mishoe

DELAWARE TECHNICAL AND COMMUNITY COLLEGE

EXECUTIVE DIRECTOR

Paul K. Weatherly

DEPARTMENT OF PUBLIC INSTRUCTION

STATE SUPERINTENDENT

Kenneth C. Madden

OFFICE OF THE GOVERNOR

CHAIRMAN, COUNCIL ON SCIENCE AND TECHNOLOGY

Nisson A. Finkelstein

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## I. Description and Development of the Program

The expansion of scientific knowledge and the continuing development of an economy oriented toward science and technology are changing Delaware from an agrarian to an industrial state. Delawareans have all the problems associated with this change. They look to their schools for help with solving these problems and to the University for improving the preparation of their teachers.

The preparation of new teachers, the continuous training of inservice teachers, and the dissemination of information about new curriculum materials are three related problems. Excellent materials are available, but many teachers do not know how to use them. This problem exists for teachers with many years experience, and the fledgling, in many cases, comes to the classroom without much practical experience in using these materials with children.

Several groups were attacking these problems at the same time. The University Science Education Center proposed expanding its facilities and staff to provide leadership in developing a model program for all curriculum areas. Delaware State College proposed an UPSTEP program to train teachers for urban schools. The Governor's Council on Science and Technology discussed ways of expanding the supply of teachers who could meet the academic and social needs of individual students.

The DuPont Company Committee on Aid to Education recognized the problem by providing support for cooperative programs

conducted by the University and the State Department of Public Instruction for teachers of chemistry and physics. All these groups used a systems approach--identification and verification of needs, implementation of remedial programs, assessment of success with continual feedback to all concerned.

The University of Delaware invited these groups to join together in a state-wide effort to design a model program. Representatives of the State Department of Public Instruction, Delaware State College, Delaware Technical and Community College, the Governor's Council met at the University of Delaware to discuss a systems approach. They formed the Augmented Council of Presidents and named an Ad Hoc Committee to develop this cooperative effort and to seek funding.

The significance of the undertaking should not be minimized. It represents the first attempt to coordinate formally all segments of education within Delaware so that maximum impact can be made to reach teachers from pre-school through college or university. Funds from the National Science Foundation, U.S. Office of Education, NOAA Sea Grant, and DuPont Company provided supplemental support for the Delaware Model program in 1971-2. Local school district and institutional funds provided matching monies. All institutions re-directed their regular programs to enhance the success of this cooperative plan.

The 1972-3 proposal provided support for a wider variety of projects to meet specific needs identified during the first

year's operation. Some projects were phased-out because they did not provide acceptable teacher training experiences. Others were incorporated into regular institutional activities as immediate needs were met.

The teacher education activities are grouped as follows:

1. Resource Center Services. Teachers can meet their own individual needs for interesting classroom materials or information about a particular topic through the center. Self-instructional modules for developing individual competency in operating audio-visual equipment, demonstrating inquiry skills, developing classroom evaluation, understanding research procedures and training for Special Education classes are also housed in the Center. The librarians and media technologist assist teachers with information retrieval, materials examination, and media preparation. Both pre and inservice teachers may visit a Center during regular hours. Faculty and staff arrange special sessions for large groups.
2. Field Agent Activities. Special seminars are conducted for groups of teachers who identify similar needs. Usually the activities concentrate on orienting inservice teachers to available resources and strategies for implementing their use in the classroom. Field Agents also visit

individual classrooms to provide more personal assistance. Because Agents do not teach regularly scheduled courses, they are free to arrange their schedules to meet the needs of teachers. Because they do not report evaluative information about their clientele to institution or school district supervisors, they gain ready acceptance by pre and inservice teachers. Field Agents and local district Resource personnel also receive additional on-the-job training through Leadership Training Project and through monthly staff conferences.

3. College/University Projects. Participants get involved through formal course work, development projects or non-credit symposia when their needs can be met most adequately through the special expertise of faculty members. These new training activities and materials help induce changes in the regular teacher education program at each institution and improve inter-college cooperation.
4. Local District Projects. At times, a need to develop special competence for a particular school district is identified by teachers and their administrators. Projects involve inservice education, materials development, or clinical experiences for teacher trainees. For example,

teachers were trained in module development during a Summer Workshop and then tested the materials with students during the school year.

Research, development and dissemination of teacher training materials and strategies permeate throughout these activities. Materials for individualizing classroom instruction and teacher education are developed and evaluated in a variety of settings. The tested materials are distributed through the Resource Centers to Field Agents, resource personnel, faculty, inservice teachers and teacher trainees. This multi-faceted systems approach identifies and meets both individual and institutional needs.

## II. Objectives

The general goals of the Del Mod System are:

A. To coordinate all segments of science and mathematics teacher education in the state so that a maximum impact can be made in reaching all students from per-elementary through doctoral level. Teacher education is defined as all activities and experiences designed for the specific purpose of preparing teachers at the pre-service and/or inservice level.

B. To improve the extent and quality of effective teaching at the pre-elementary, elementary, secondary, and college levels of the state which will result in learners who are better educated and have a greater interest in their world.

C. To provide a favorable climate for research and development activities in teacher education.

The specific objectives of the Del Mod System are:

1. Given the proper data, monitoring system, and feedback mechanism, change in teacher education as reflected through changes in teacher attitudes, pre-service and in-service preparation programs, student attitudes, and student achievement will be demonstrated over a five-year period as a result of research, cooperative planning, pilot projects, and pre-service and

inservice training.

2. Provided with a cadre of trained resource personnel, individual schools, districts, or regions will improve teacher competence, emphasizing an interdisciplinary mix through continuing education programs. The nature and type of these programs will be determined by analysis of present status of teacher education.
3. Given this group of educational leaders and sources of materials, individual schools will develop integrated curricula with a built-in system for formative and summative evaluation.
4. The schools will incorporate into their on-going programs newly developed curricula or modifications thereof given the proper training, both pre-service and inservice, and the sources from which to select materials.
5. With the proper programs, leadership, and resources, teachers will develop, try-out, evaluate, and modify programs, materials, and strategies for varying student ability levels within their classroom for an individualized approach to learning.
6. Science teachers will demonstrate the relationship between mathematics and science in their classroom presentations by incorporating mathematical functions into daily classroom practices. Conversely

mathematical teachers will demonstrate the relationship of mathematics in their classrooms given the leadership and dissemination techniques to encompass the language and methods common to both.

7. Given the appropriate training a group of educational technicians will demonstrate their contribution to an instructional team under the supervision of certified teachers.

III. Personnel

A. Augmented Council of Presidents

1971-3 Edward A. Trabant, President
University of Delaware

1971-3 Luna I. Mishoe, President
Delaware State College

1971-3 Paul K. Weatherly, President
Delaware Technical and Community College

1971-3 Kenneth C. Madden, State Superintendent
Department of Public Instruction

1971-2 Robert Cairns, Chairman

1971-2 Burt C. Pratt

1972-3 Nisson A. Finkelstein
Governor's Council on Science and Technology

B. Ad Hoc Committee to prepare proposal

Chairman, Billy E. Ross, Associate Dean
College of Education, University of Delaware

Charlotte H. Purnell, State Science Supervisor
Department of Public Instruction

Ethel Lantis, Dean of Development
Delaware Technical and Community College

Hazel Williams, Chairman, Chemistry Department
Delaware State College

C. Executive Committee

Billey E. Ross, Associate Dean
College of Education, University of Delaware

Milford Caldwell, Dean of the College
Delaware State College

Randall H. Broyles, Assistant State Superintendent
Department of Public Instruction

William Norton, Director of Development
Delaware Technical and Community College

D. Component Institutions

1. Del Mod Office

Charlotte H. Purnell, Director

a. Field Agent Project 1971-3

Barbara A. Logan 1971-3

James H. Gusset 1971-3

Bruce A. Watt 1971-3

Audrey Connoway 1972-3

b. Research Office

John R. Bolig, Director

c. Local District Projects

Charlotte H. Purnell, Director

2. University of Delaware Component

Robert L. Uffelman

a. Resource Center

John F. Herrmann, Media/Materials Specialist 1971-2

Mary Trenholm, Assistant Librarian 1971-3

Barbara Giebelhaus, Librarian 1972-3

Dennis R. Williams, Assistant Director 1972-3

Janet Holm, Supervisor, A-V Equipment Laboratory 1972-3

Mary Wolfe, Supervisor, Individual Testing Program 1972-3

b. Leadership Training 1971-3

Robert L. Uffelman, Director 1971-3

Bruce A. Watt, Instructor, College of Education 1971-2

Robert M. Gagne, Instructor Physics Department 1972-3

c. Chemistry and Physical Science 1971-3

Seymour Yolles, Director 1971-2

Wayne P. Anderson, Director 1972-3

George McClure, Asst. Professor of Chemistry Department 1971-2

James R. Moore, Associate Professor, Chemistry 1971-3

Thomas B. Brill, Assistant Professor, Chemistry 1971-2

John H. Miller, III, Associate Professor, Physics 1971-3

John J. Beer, Associate Professor,
History 1971-2

Carl A. von Frankenberg, Associate
Professor, Chemistry 1971-2

d. Marine Science Curriculum Project

James P. Schweitzer, Director 1971-2

Maura Geens, Instructor 1971-2

e. Laboratory Approach to Elementary Math 1971-3

John A. Brown, Director 1971-3

Verena I. Sharkey, Coordinator 1971-3

Neil Walzl, Newark Schools Instructor
1972-3

Richard R. Koch, Conrad Schools
Instructor SS 72

f. Math for Science Teachers 1972-3

W. E. Baxter, Director

T. J. Kearns, Assistant Professor,
Math Department

g. General Science Teaching Strategies

D. W. Knight III, Assistant Professor,
C & I Department 1972-3

h. Engineering Concepts 1972-3

D. M. Robinson, Director

i. Computer Education 1972-3

David P. Yens, Assistant Professor

j. Coastal Studies, 1972-3

John C. Kraft, Chairman, Geology Dept.

Robert E. Lewis, Alfred I. DuPont Schools

k. Secondary Science 1972-3

R. L. Uffelman, Director

Francis A. Castelli, Alfred I. DuPont Schools

3. Delaware State College Component

Columbus B. Ricks, Coordinator 1971-2

L. R. Machen, Coordinator 1972-3

a. UPSTEP Project 1971-3

Columbus Ricks, Director

b. Backgrounds in Physical Science 1972-3

Columbus Ricks, Director

4. Delaware Technical and Community College, Southern Campus Component

Ethel M. Lantis, Coordinator

a. Resource Center 1971-3

Ellie Sloan, Librarian

b. Science Education Technician 1971-3

Becky Bachman, Director 1971-2

Mary E. Stein, Director 1972-3

5. Department of Public Instruction

John E. Reiher, Coordinator 1971-3

a. Inservice Education 1971-2

John E. Reiher, State Science Supervisor

b. Career Science 1971-3

Randall L. Broyles, Assistant State Superintendent

c. Needs Assessment and Dissemination 1972-3

David Morgan, Specialist

d. Environment Education

Mrs. J. Daum, Specialist

IV. Budgets

1971-72

1972-73

SUMMARY BUDGET - THE DEL MOD SYSTEM

1971 - 1972

| COMPONENT | NATIONAL SCIENCE FOUNDATION | DU PONT | OTHERS | INSTITUTIONAL | DEPARTMENT OF PUBLIC INSTRUCTION | COOPERATING SCHOOLS |
|---|---|---|---|---|---|---|
| Director | 45,828 | 15,675 | | | | |
| Science Field Agent | 49,278 | 30,000 | | 7,879 | | 5,000 |
| Baseline Data | 23,000 | | | | 500 | |
| Department of Public Instruction | | | | | | |
| Inservice Education | 8,625 | | | | 900 | 2,000 |
| Component Coordinator | 575 | | | | 9,500 | |
| Delaware Technical & Community College | | | | | | |
| Science Education Technician | 8,625 | | | 2,990 | | |
| Component Coordinator | 13,656 | | | 3,300 | | |
| Science Resource Center | 41,660 | | | | | |
| Delaware State College | | | | | | |
| UPSTEP | 30,670(FY2) | 4,000 | | 4,800 | | |
| Component Coordinator | 11,903 | 10,000 | | 500 | | |
| University of Delaware | | | | | | |
| Science Leadership | 20,010 | 20,000 | | 4,176 | | |
| Marine Envionment | 22,880 | 12,600 | 29,426[1] | 7,588 | | |
| Population Curriculum | 35,403 | 17,500 | | 7,389 | | |
| Chemistry | 30,814 | 40,000 | | 2,424 | | |
| Physical Science | 13,488 | | | 2,220 | | |
| Component Coordinator | 16,963 | 12,500 | | 7,040 | | |
| Science Resource Center | 45,660 | | | 9,558 | | |
| Math Lab | 2,300 | | | | | |
| Grant & Expenditures Totals | 421,338 | 163,275 | 29,426 | 59,864 | 10,900 | 7,000 |

GRAND TOTAL $ 691,803 .

[1]Requested from Sea Grant

[2]Includes funds expended previously.

1972-73

GENERAL BUDGET SUMMARY

DEL MOD SYSTEM

| Component | NSF FY 73 | NSF FY 72 | INDUSTRY | COMPONENT | SCHOOLS | OTHER |
|---|---|---|---|---|---|---|
| 1. University of Delaware | 162,421 | 42,064 | 20,500 | 119,303 | 8,002 | 18,000* |
| 2. Delaware State College | 89,976 | 8,000 | 4,000 | 69,615 | 0 | 0 |
| 3. Department of Public Instruction | 40,000 | 0 | 7,500 | 31,170 | 0 | 0 |
| 4. Delaware Technical and Community College | 65,268 | 0 | 0 | 24,976 | 0 | 0 |
| 5. Director's Office | 241,566 | 0 | 97,350 | 14,500 | 78,840 | 0 |
| Totals | 599,231 | 50,064 | 129,350 | 259,564 | 86,842 | 18,000 |

* Residual FY 72 DuPont Funds

## BUDGET SUMMARY - UNIVERSITY OF DELAWARE

| Project | NSF FY 73 | NSF FY 72 | DuPont Co. FY 73 | DuPont Co. FY 72 | Component | School |
|---|---|---|---|---|---|---|
| 1. Resource Center | 33,251 | | | | 18,131 | |
| 2. Leadership Training | 20,298 | 2,754 | 5,000 | 18,000 | 17,192 | |
| 3. Physical Science | 35,613 | | | | 10,136 | |
| 4. Secondary Science | | 24,363 | | | 23,000 | |
| 5. Coastal Studies | | 14,947 | | | 487 | |
| 6. Math Laboratory Approach | 9,990 | | | | 5,043 | |
| 7. Math For Science Teachers | 8,900 | | 5,000 | | 2,788 | |
| 8. General Science Strategies | 13,130 | | 500 | | 13,610 | |
| 9. Engineering Concepts | 9,565 | | 5,000 | | 5,631 | 8,002 |
| 10. Computer Education Project | 8,258 | | 5,000 | | 15,436 | |
| 11. Coordinator's Office | 23,416 | | | | 7,849 | |
| TOTAL FY 72 | | 42,064 | | 18,000 | | |
| TOTAL FY 73 Request | 162,421 | | 20,500 | | 119,303 | 8,002 |
| Total Request | 182,921 | | | | | |
| GRAND TOTAL (University, NSF, and DuPont Funds) | 310,226 | | | | | |

## DELAWARE STATE COLLEGE

| Projects | NSF FY 73 | INDUSTRY | (NSF) FY 72 | COMPONENT | SCHOOL |
|---|---|---|---|---|---|
| 1. Component Coordinator | 5,405 | 0 | 8,000 | 4,247 | |
| 2. Science Resource Center | 49,450 | 0 | 0 | 34,828 | |
| 3. UPSTEP | 29,348 | 4,000 | 0 | 29,615 | |
| 4. Physical Science for Middle School Teachers | 5,773 | 0 | 0 | 328 | |
| Totals | 89,976 | 4,000 | 8,000 | 69,018 | |

## DEPARTMENT OF PUBLIC INSTRUCTION

| Projects | NSF FY 73 | INDUSTRY | COMPONENTS | SCHOOL |
|---|---|---|---|---|
| 1. Career Science | 7,400 | 7,500 | 2,900 | - |
| 2. Component Coordinator | 500 | 0 | 17,455 | - |
| 3. Needs Assessment and Dissemination | 32,100 | 0 | 10,815 | - |
| Totals | 40,000 | 7,500 | 31,170 | - |

## DELAWARE TECHNICAL AND COMMUNITY COLLEGE

| Project | NSF FY73 | NSF FY 72 | INDUSTRY | COMPONENT | SCHOOLS |
|---|---|---|---|---|---|
| 1. Science Education Technician | 21,930 | 0 | 0 | 7,673 | 0 |
| 2. Component Coordinator | 15,473 | 0 | 0 | 7,603 | 0 |
| 3. Science Resource Center | 27,865 | 0 | 0 | 9,700 | 0 |
| Totals | 65,268 | 0 | 0 | 24,976 | 0 |

## BUDGET SUMMARY - DIRECTOR

| Projects | NSF FY 73 | INDUSTRY | COMPONENTS | SCHOOL |
|---|---|---|---|---|
| * A. Local District Programs | | | | |
| 1. Alexis I. DuPont | 4,700 | 1,400 | - | 5,205 |
| 2. Alfred I. DuPont | 6,100 | 2,500 | - | 5,615 |
| 3. Newark | 7,900 | 3,100 | - | 5,192 |
| 4. Marshallton-McKean | 5,000 | 2,500 | - | 3,450 |
| 5. Stanton | 5,400 | 2,500 | - | 4,810 |
| 6. Capital | 1,000 | 1,200 | - | 850 |
| 7. Mount Pleasant | 2,450 | 1,750 | - | 3,468 |
| 8. Indian River | 2,200 | 1,200 | - | 6,830 |
| 9. Appoquinimink | 1,200 | 1,800 | - | 3,380 |
| 10. Seaford | 4,800 | 1,200 | - | 5,720 |
| 11. New Castle-Gunning Bedford | 6,000 | 750 | - | 3,100 |
| 12. Caesar Rodney | 3,600 | 2,000 | - | 5,388 |
| 13. Wilmington | 11,585 | 14,850 | - | 11,237 |
| 14. Cape Henlopen | 3,700 | 600 | - | 4,750 |
| Totals | 65,635 | 37,350 | | 68,995 |

*Note: Allowance for indirect cost on these projects will be contributed by the schools toward the maintenance of the Director's office.

BUDGET SUMMARY - DIRECTOR (CONTINUED)

| Projects | NSF FY 73 | INDUSTRY | COMPONENTS | SCHOOL |
|---|---|---|---|---|
| B. Field Agent Programs | | | | |
| 1. Director's Office | 23,633 | - | - | - |
| 2. Kent and Sussex County | 24,863 | 6,000 | 2,000 | - |
| 3. Eastern New Castle County | 25,712 | 9,000 | 2,500 | - |
| Totals | 74,208 | 15,000 | 4,500 | - |
| (Field Agent programs specifically designed for local districts are listed above and are not considered as part of the operating budgets for Field Agents) | | | | |
| C. Director's Office | | | | |
| 1. Director | 62,810 | 45,000 | 10,000 | 3,000 |
| 2. Research and Evaluation | 38,913 | - | - | 6,845 |
| Totals | 101 723 | 45,000 | 10,000 | 9,845* |
| Grand totals (Director's Component) | 241,566 | 97,350 | 14,500 | 78,840 |

*Note: Indirect cost allowance contributed from the schools.

V. Evaluation Procedures and Data

Evaluation of the Del Mod System consists of:

(1) comparing changes in teacher and learner characteristics

(2) changes in institutional programs for teacher education

(3) participant judgment about the projects and,

(4) expert opinions about the effectiveness of the system.

In developing objectives for categories 1 and 2 all available sources of information were utilized. These sources were:

A. Purnell, C. H. The Status of Science Teaching in Delaware, State Department of Public Instruction, Dover, Delaware, June, 1969.

B. Miller, Marian, et. al., Assessment of Educational Needs in Delaware, State Department of Public Instruction, Dover, Delaware, March, 1970.

C. Enrollment Data:
University of Delaware
Delaware State College
Delaware Technical and Community College.

D. National Science Foundation Participant Roster - 1967-1970.

E. Interviews:
Science Education Faculties
Chief School Officers
Principals
Directors of Curriculum, public, private and parochial
Teachers
Science Supervisors
Industrial Representatives
American Chemical Society, Education Committee.

F. Scientists and Science Educators from Delaware State College and the University of Delaware.

Trends in student and teacher characteristics are shown in the following table. Note the general trend in consolidation of school districts, the increase in percentage of students attending college and the decrease in number of teachers holding sub-standard certificates.

EDUCATIONAL TRENDS IN DELAWARE SINCE 1960

| | 1960 | 1965 | 1968-1969 | Change and Trend 1960-1969 |
|---|---|---|---|---|
| Number of School Districts | 92 | 56 | 26 | 72% decrease |
| Total School Enrollment | 82,200 | 106,500 | 124,600 | 34% increase |
| Number of High School Graduates | 3,850 | 5,950 | 6,160 | 37.5% increase |
| Percent of Graduates Entering 4-year College | 21 | 30 | 32 | 34.4% increase |
| Percent of Graduates Entering 2-year College | 11 | 12 | 16 | 31.3% increase |
| Percent of teachers holding substandard certificates | 15 | 6.5* | 7 | 53.3% decrease |
| Educational Cost Per Pupil | $539 | $593 | $738** | 27% increase |

Source: Delaware State Department of Public Instruction, Digest of Educational Information, Delaware Schools. 1968

*Estimated

**State supported show-about 76% of total expenditure per pupil

Data available for student characterists are shown in the following table. Note the great discrepancy between lowest mean scores and highest mean scores on these tests. Pupils' achievement varies considerable within the state and poses a real problem for teachers.

RANGES IN PUPIL CHARACTERISTICS
(based on local district means)
1968-69

| Pupil Characteristic | District Having Lowest in the State | District Having Highest in the State |
|---|---|---|
| Average Daily Attendance | 81.8% | 95.7% |
| **Reading Achievement** | | |
| Grade 4 - "Poor Readers" (bottom 3 stanines) | 3% | 78% |
| Grade 4 - "Good Readers" (top 3 stanines) | 4% | 44% |
| Grade 5 - "Poor Readers" (bottom 3 staniness) | 6% | 59% |
| Grade 5 - "Good Readers" (top 3 stanines) | - | 56% |
| **Arithmetic Achievement** | | |
| Grade 5 - (mean raw score in district) | | |
| Computation | 3 | 28 |
| Problem Solving | 14 | 30 |
| **Differential Aptitude Test - Grade 8** | | |
| Verbal Reasoning (mean percentile of district) | 25%-tile | 81%-tile |
| Numerical Ability | 19%-tile | 67%-tile |
| Abstract Reasoning | 22%-tile | 73%-tile |
| Language Usage I-Spelling | 30%-tile | 67%-tile |
| Language Usage II-Grammar | 25%-tile | 71%-tile |
| Graduates entering 4-year colleges | 14% | 67% |
| Graduates entering 2-year colleges | - | 20% |
| Graduates taking other training | - | 29% |
| Graduates going directly to work | 8% | 50% |

Representatives of Delaware schools and local interest expressed concern about the status of teacher preparation within the state. Their expert opinion was sought at a conference. The results of their deliberations are included in the following report:

**Del Mod Conference**
**Holiday Inn**
**Dover, Delaware**
**September 18, 1970**

**Summary of Proceedings**

**The conference for the Del Mod System for the Improvement of Science Education in Delaware was held on Friday, September 18, 1970, at the Holiday Inn in Dover. Each school district was represented as well as personnel from three institutions of higher education, industry, and the Department of Public Instruction.**

**Dr. Billy E. Ross, Chairman of the Ad Hoc Committee appointed by the Augmented Council of Presidents to plan and implement the Del Mod System, opened the conference with an overview of the Committee's efforts to develop a system approach for the improvement of science education in Delaware. Dr. Ross identified and discussed the rationale and goals of the Del Mod System and emphasized the need for wide participation in the development of the proposal.**

**On behalf of the University of Delaware, Dr. E. A. Trabant, President, stated that the University's commitment to the Del Mod System was enthusiastic and complete. One avenue of incorporating the Del Mod System into the University framework might possibly be an enlargement of the department of science. This department, involving faculty for the Colleges of Education and Arts and Science, would provide a better interdisciplinary approach. With the service concept of the Del Mod System as the major thrust, expansion of the science department seems a logical avenue for implementation of the Del Mod System.**

Dr. Kenneth C. Madden, State Superintendent, perceived the role of the Department of Public Instruction to be one of coordination and liaison between the various components of the Del Mod System and the schools of Delaware. He also cited the Department's responsibilities for collection and analysis of baseline data to determine the actual needs in science as a part of the increased department role of service to the districts. Dr. Madden stressed the need to build into state budgets the financial responsibility for assuming the support of the successful programs after the initial funding was phased out.

Dr. Luna Mishoe, President of the Delaware State College, described the new science education program initiated this year at Delaware State College. The program is largely tailored to train junior high school science teachers -- providing for maximum classroom experience as well as testing new patterns in utilization of cooperating teachers. Dr. Mishoe strongly emphasized the commitment of Delaware State College to the Del Mod System to the extent permitted by a four-year baccalaureate institution.

Mr. Stephen Betze, substituting for Mr. Paul Weatherly of Delaware Technical and Community College, reiterated the total commitment of the college to the Del Mod System. Although Mr. Betze characterized the role of Delaware Technical and Community College as a peripheral one, he cited the deep concern of the college for science preparation of all students. Since many of the college programs depend on an adequate science background, the goal of a scientifically literate society is of vital interest to Delaware Technical and Community College.

Governor Russell Peterson said that he viewed the Del Mod System as a precursor to many cooperative projects which are possible in this small state. With the talent, leadership, and resources available, Delaware can become a model state with many educational innovations. The Del Mod System is already attracting considerable nationwide interest and can provide a demonstration of partnership agreements between state, federal, industrial and private sources to accomplish a profound educational change. Governor Peterson also added that he would look forward to the time when the system approach to improved education was fully operative.

In expressing the viewpoint of the industrial-scientific communities, Dr. Robert Cairns, Vice-President of Hercules, Incorporated, pointed to the need for an understanding of the scientific enterprise by all the citizens. Although the continued growth of science-based industry lies in stimulating young people to pursue careers in the sciences, of greater significance is the education of all citizens to make wise decisions about the use and control of the environment. To this end industry is actively interested in the Del Mod System and will offer support and advice.

Dr. Burt Pratt, Executive Secretary of the DuPont Committee on Educational Aid, supported the points discussed by Dr. Cairns. In addition, Dr. Pratt stated that the DuPont Company would offer assistance toward active implementation of the Del Mod System.

## Summary Report of Work Sessions

Many outstanding individual ideas were offered; however, the following summaries represent concensus ideas from all discussion groups:

### Science Resource Centers

In response to the query on the kinds of materials which should be housed in the centers, such materials as texts, packaged materials which accompany texts, resource books, materials for construction of equipment, unipacs, materials and facilities for repair of equipment, films and tapes of master teachers and new programs, audio-visual materials, pamphlets, trade catalogs should be included.

The centers ideally should be located at Georgetown, Dover, Wilmington and Newark with possible mobile units attached to each.

The kinds of services desired should be:

a. lending service to permit teachers to try out material or units before purchase.

b. a facility in which a school or curriculum committees could meet to develop curriculum or hold inservice meetings.

c. a place where pre-service teachers and inservice teachers could meet and share ideas.

d. a base from which a field agent could operate, hold in-service meetings or bring in individual teachers. Several expressed the opinion that the field agent would be the key to success.

e. a center for community scientific activities, i.e., lectures, seminars, meetings, etc., for any science related group.

f. provision for construction of equipment with many simple materials on hand.

g. hours convenient to teachers' schedules with odd times for use of pre-service teachers or training of para-professionals.

h. provision for construction of audio-visual materials.

i. it is not a place for student activities unless accompanied by a teacher.

Regarding the relationship of each center and pre-service education, inservice education, local districts and field agents, all groups stressed the need for cooperation and use by all. One group suggested an advisory group for each center to insure the cooperation and acceptance by the districts.

Inservice Education

Although there was wide variance regarding the kind of inservice training needed, most groups felt that the district should request the kind of inservice program best suited to their needs. The baseline data study should point out to each district its needs; then decisions should be cooperatively made on the areas and levels of training desired. Care should be taken to avoid structuring programs only for those already competent in content fields or teaching techniques but be planned to provide for all of the staff.

No best location was specified; however, most felt that the type of program should determine the location. For some, within the district would be best, for others, the resource center would be ideal and still others might function for a combination of several nearby districts. Most stressed the need for little expenditure of time for travel.

There were many suggested times for holding inservice progr s. Most groups felt release time with qualified substitutes, a circuit science teacher who would free the regular teacher or extension of the teacher year to include a full 10 months employment, would be the best times. There was unanimous agreement against any Saturday programs. One group suggested an extension of the school year with time after the Christmas holdiay for inservice activities.

One group recommended provision for built-in feedback to a neutral source on strengths and weaknesses of the programs. Still another group commented on need for removal of grades and tests as part of an inservice program but credit toward salary should be included in all programs.

Science Education Leadership

All groups felt science education leaders should be capable of meeting whatever inservice needs a district deems would be beneficial. After the needs are identified, then a practicing teacher or supervisor who displayed expertise in the area desired should be asked to undergo training. Several groups emphasized the necessity of having individuals experienced in new curricula trained to conduct inservice programs.

Strong recommendations were placed on the acquisition of skills needed for successful intrapersonal relations. Above all, they should be counseled and instructed on the methods for successful experiences with adults. For some an internship with the Department of Public Instruction, local districts or United States Office of Education would be desirable for becoming acquainted with the particular functions of each if their ultimate goal was that of supervisor of field agent.

The function of science leaders was perceived as that of supervisor/coordinator or an instructor of an inservice program. It was strongly recommended that the position of leaders be given status with the institutions of higher education or the Department of Public Instruction so that credit would be available toward certification or graduate work.

Preservice Education

All groups agreed that the best teacher of teachers is an experienced teacher and that presently too little reliance is attached to this valuable resource. It was recommended that competent teachers be assigned students as early as the second year so that a confidence level is built-up; however, the competent teacher should remain in close contact with the preparing institution. In addition, remuneration for the added responsibility should be increased but the experienced teacher should also be willing to be trained in latest pedagogy, materials, and methods.

The preservice experience should begin early in the student's career and not be confined to a single environment within the school or community. Greater emphasis should be placed on intercity and rural experiences and exposure to various grade levels. In addition, all facets of teaching should be explored as well as the styles of many teachers.

The equiping of prospective teachers with the tools for coping with the problems of today's youth was requested frequently. Visits to mental hospitals, courts, jails, student councils, social workers, governmental agencies, and others should be included as part of "social problems" courses. One suggestion was the formation of college, high school, junior high school councils without the benefit of adult participation to expose the preservice teacher to youth problems.

Most groups felt orientation to a specific curriculum should be a part of preservice as well as inservice training; however, most stressed the need for broad-base preparation with specialization at a later time.

Science Field Agent

No clear pattern was available regarding a job description of a field agent. At best, the field agent was perceived as a coordinator without administrative responsibilities. His primary responsibility should be a teacher of teachers with the main requirement the ability to establish rapport with teachers and administrators. He was also perceived as the key person to keep communications flowing, to interpret needs, and dispense information. Sometimes he could be an individual tutor. The agent should have a "territory" so that all teachers know who he is and that he is available to help them with their problems. It was pointed out that many teachers do not recognize their problems and the field agent, in a tactful way, should point out the weaknesses and assist in correcting them. Most groups felt that the field agent component was the strongest member of the Del Mod System.

Industry

Industry was excited about a cooperative program between all segments of the educational community and would be prepared to support the concept financially, as well as with personnel. The field agents and resource centers were viewed as the keys to success of the Del Mod System but authority of the agents remained unclear. Concern was also expressed for incorporating the humanistic side of science into the structure.

Analysis of the data compiled from the sources identified in the preceding section revealed many needs. In some instances the needs were substantiated by available data; in other cases, needs could not be documented but were placed in a class for further investigation.

As revealed, the needs of teacher education in Delaware are as follows:

A. Easily accessable resource centers for browsing, borrowing, curriculum development and in-service activities.

B. Programs to improve the mathematical competency of science teachers as mathematics relates to science teaching.

C. Materials and techniques designed to enhance the learning capacities of urban children.

D. Materials for environmental education and a scheme for using such materials.

E. The improvement of strategies for dealing with the middle school child.

F. The development of residence areas for outdoor education.

G. Materials, methods and programs for the non-academic student with relationship to occupational-vocational programs.

H. Materials, methods and programs for non-scientifically oriented students particularly in grades 11 and 12.

I. Inclusion into present programs the impact of technology on society and the use of technology, i.e., computers and calculators.

J. Broad-based science knowledge in background preparation of science teachers and in-service teachers, i.e., a sampling of many areas.

K. Earlier contact with real school situations by pre-service teachers so that their preparation focuses on greater on-the-job training.

L. In-service activities designed to meet district needs, i.e., urban, rural, migrants, suburban.

M. Improved facilities for science learning at the junior high school and middle school level.

N. Attention of individual needs of upper elementary and middle school children.

O. Understanding by administrators of particular needs of science teachers for different groups of children.

P. Collecting and storing for rapid retrieval baseline data regarding each science and mathematics teacher, program and student in Delaware and the development of a monitoring system for the review, evaluation, and revision of programs.

Q. Programs designed to meet the special needs of exceptional children.

Specific data about the science teacher preparation were gathered from the Department of Public Instruction. These data are shown in the following tables.

Further data about teacher knowledge and attitude toward science were sought. The Test on Understanding Science (TOUS) was administered to a sample of junior and senior high school teachers.

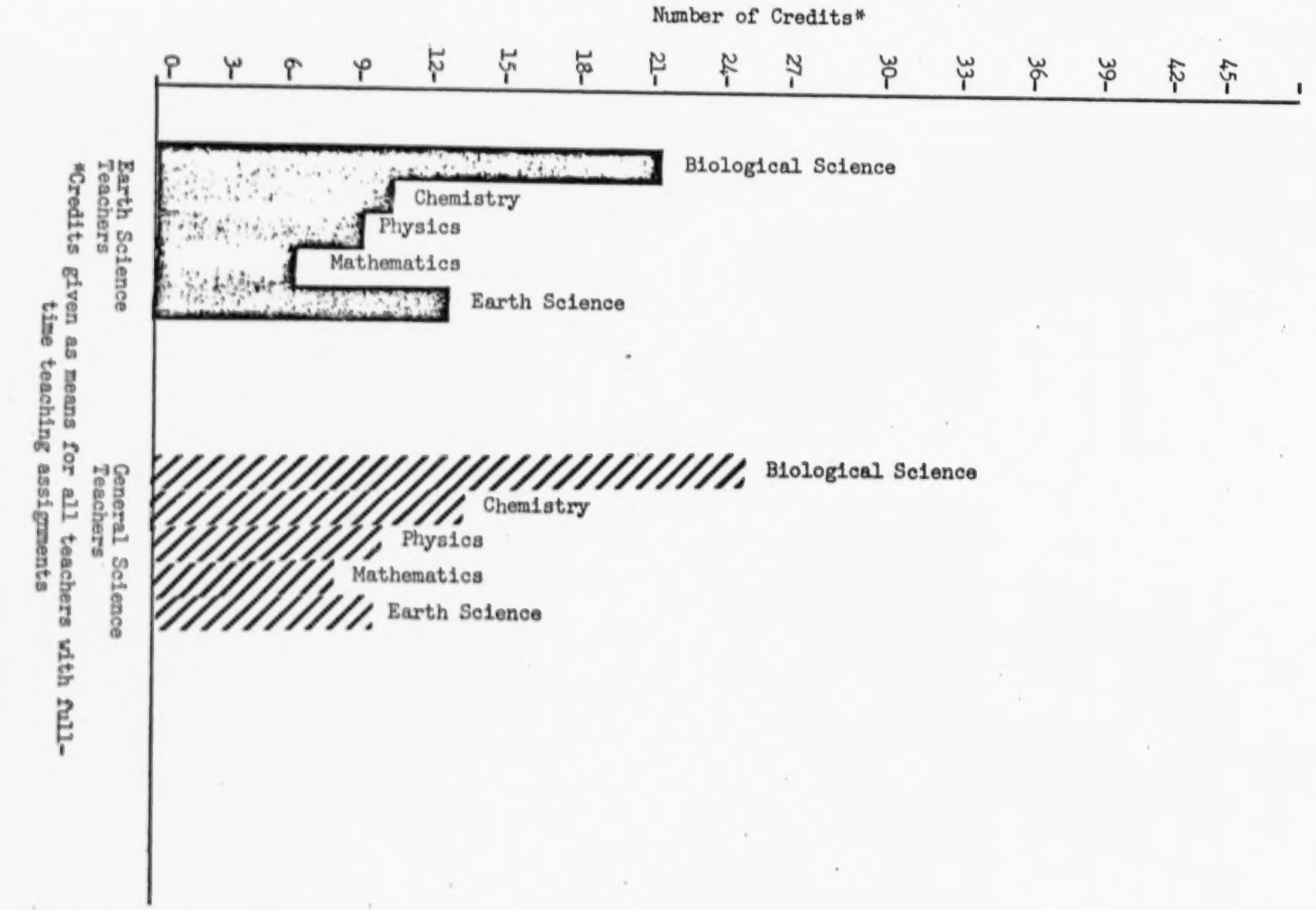
The nature of their teaching strategies were also examined. Very few teachers were using independent study or modularized materials as shown in the graph comparing teaching strategies.

This information became part of the Base-line data for future comparisons to determine if the objectives are met by the System and by individual projects. Data are gathered through the State Department of Public Instruction, from component institutions and from individual project directors. This continual evaluation is summarized annually by the Director of Research and by components. The accompanying Annual Report provides a total picture. Sample data about project cost-effectiveness are included as examples of standard source criteria. Participant reactions to the Resource Centers are included as a sample of participant judgment data used to assess the effectiveness of projects.

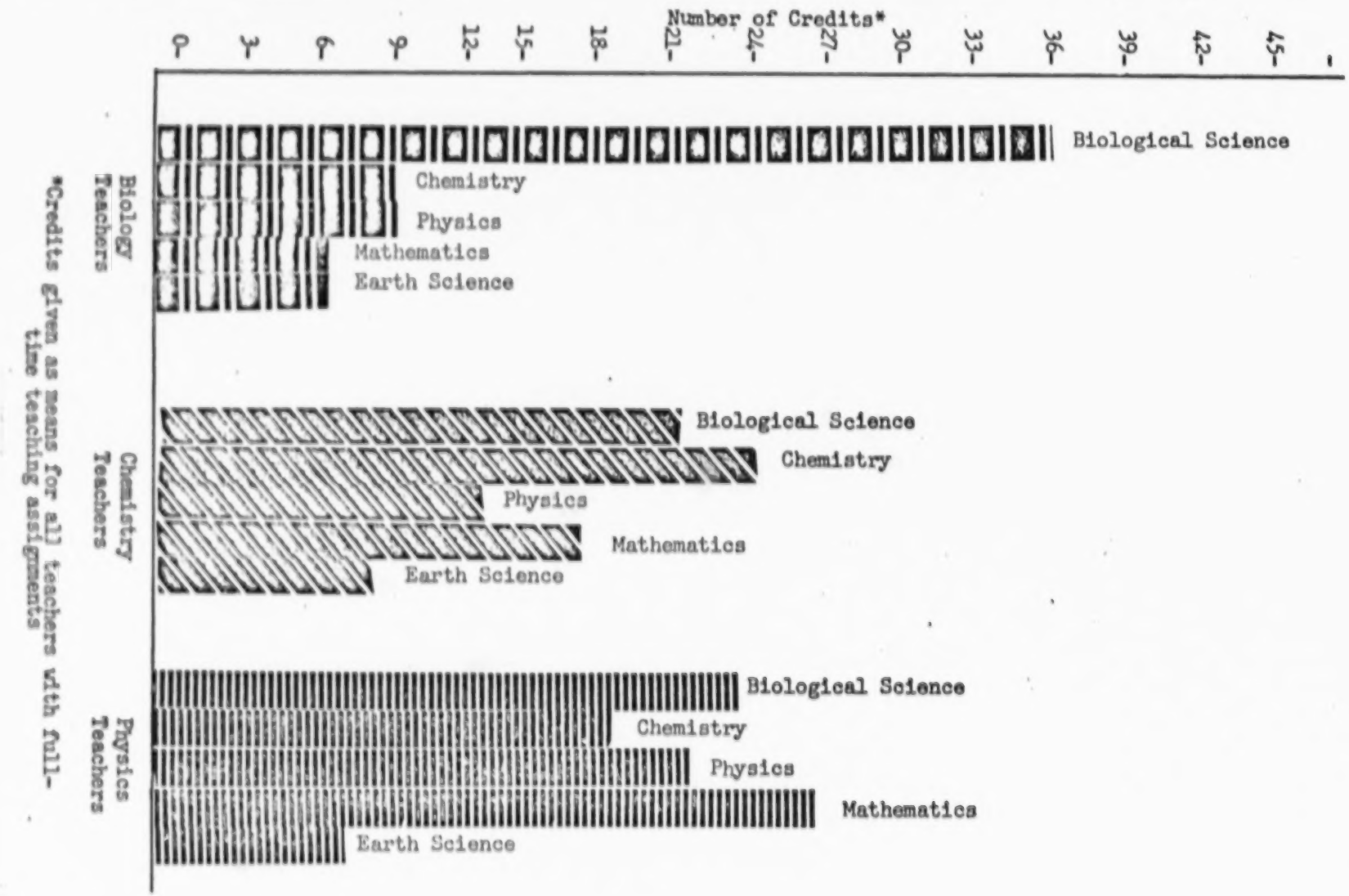
COMPARISON OF PREPARATION IN SCIENCE OF TEACHERS HOLDING BACHELOR'S AND MASTER'S DEGREES

| Teaching Field | Mean Number of Credits | | | | |
|---|---|---|---|---|---|
| | Biology | Chemistry | Physics | Mathematics | Earth Science |
| Biology-all teachers | 36 | 8 | 8 | 6 | 3 |
| Bachelor's Degree | 28 | 8 | 8 | 3 | 0 |
| Master's Degree | 38 | 12 | 8 | 6 | 6 |
| Chemistry-all teachers | 20 | 24 | 12 | 15 | 3 |
| Bachelor's Degree | 12 | 24 | 12 | 14 | 0 |
| Master's Degree | 20 | 26 | 14 | 15 | 8 |
| Physics-all teachers | 23 | 18 | 20 | 26 | 6 |
| Bachelor's Degree | 18 | 18 | 20 | 26 | 6 |
| Master's Degree | 23 | 18 | 20 | 24 | 6 |
| Earth Science-all teachers | 20 | 14 | 8 | 6 | 9 |
| Bachelor's Degree | 18 | 8 | 8 | 3 | 9 |
| Master's Degree | 24 | 12 | 8 | 8 | 12 |
| General Science-all teachers | 24 | 12 | 8 | 6 | 8 |
| Bachelor's Degree | 20 | 12 | 8 | 6 | 6 |
| Master's Degree | 26 | 12 | 8 | 6 | 9 |

PREPARATION OF SECONDARY SUBJECT TEACHERS* IN CONTENT FIELDS



PREPARATION OF SECONDARY SUBJECT TEACHERS* IN CONTENT FIELDS




*Credits given as means for all teachers with full-time teaching assignments

MATRIX OF CORRELATION COEFFICIENTS FOR DATA

| VAR. NO. | 1 TOUS I | 2 TOUS II | 3 TOUS III | 4 TOUS | 5 EXP. | 6 AGE | UNDERGRADUATE 7 SCI. CR. | 8 ED. CR. | 9 MATH CR. | 10 SCI. AV. | 11 ED. AV. | 12 MATH AV. | GRADUATE 13 SCI. CR. | 14 ED. CR. | 15 MATH CR. | 16 SCI. AV. | 17 ED. AV. | 18 MATH AV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | .49* | .54* | .83* | -.07 | -.03 | .14 | -.18 | .11 | .15 | .19 | .07 | .13 | -.06 | .23* | .16 | .23* | .23 |
| 2 | | | .39* | .74* | -.08 | -.07 | .11 | -.13 | .06 | .12 | .22* | .07 | .13 | .04 | .08 | .17 | .21* | .42* |
| 3 | | | | .84* | -.06 | -.03 | .21* | -.11 | .11 | .21* | .18 | .08 | .09 | -.06 | .05 | .25* | .25* | .26 |
| 4 | | | | | -.09 | -.05 | .20* | -.17 | .12 | .21* | .24* | .10 | .14 | -.04 | .15 | .26* | .29* | .38* |
| 5 | | | | | | .85* | -.13 | -.02 | -.07 | .01 | -.23* | .04 | -.01 | .13 | .15 | -.21* | -.18 | -.11 |
| 6 | | | | | | | -.13 | .00 | -.02 | .02 | -.18 | .05 | .00 | .14 | .14 | -.15 | -.22* | -.24 |
| 7 | | | | | | | | -.34 | .07 | .06 | .11 | .07 | .08 | -.02 | -.22* | .01 | .10 | .08 |
| 8 | | | | | | | | | -.07 | -.01 | -.08 | -.09 | -.05 | -.06 | -.07 | -.06 | -.24* | -.04 |
| 9 | | | | | | | | | | .07 | .09 | .04 | .10 | .10 | .01 | .01 | .03 | .28* |
| 10 | | | | | | | | | | | .49* | .39* | .01 | -.06 | -.13 | .29* | .18 | .30* |
| 11 | | | | | | | | | | | | .27* | .02 | -.02 | -.07 | .25* | .31* | .22 |
| 12 | | | | | | | | | | | | | .22* | -.10 | -.25 | .13 | .10 | .16 |
| 13 | | | | | | | | | | | | | | -.13 | -.12 | .14 | .06 | .11 |
| 14 | | | | | | | | | | | | | | | .30* | -.10 | .00 | -.01 |
| 15 | | | | | | | | | | | | | | | | .05 | .05 | .13 |
| 16 | | | | | | | | | | | | | | | | | .24* | .47* |
| 17 | | | | | | | | | | | | | | | | | | -.01 |
| 18 | | | | | | | | | | | | | | | | | | |

*P<.05

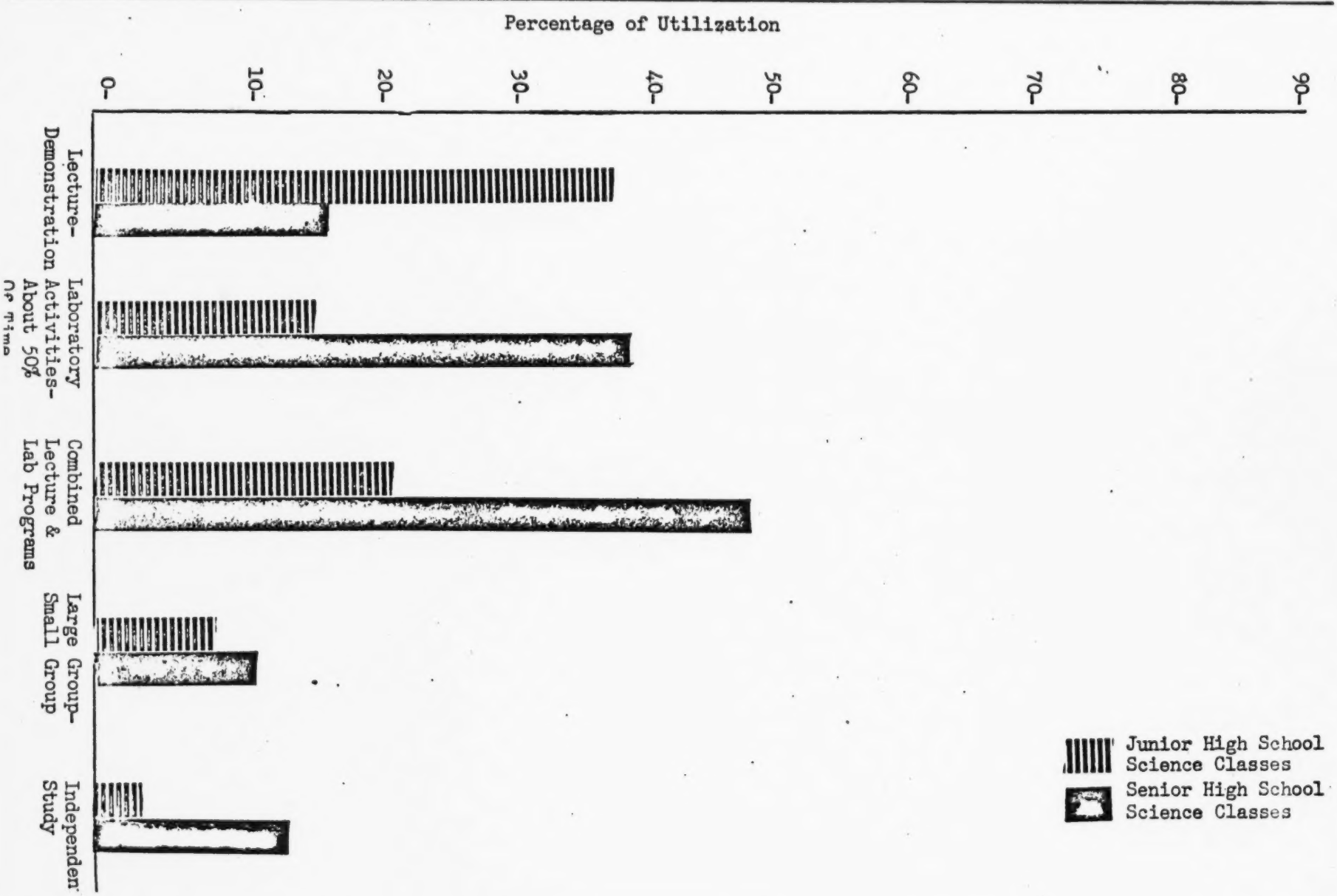
DESCRIPTIVE DATA FOR EIGHTEEN TEACHER-RELATED VARIABLES FOR 382 DELAWARE SCIENCE TEACHERS

| VARIABLE | SAMPLE SIZE | MEAN | STANDARD DEVIATION | STANDARD ERROR OF THE MEAN | MAXIMUM | MINIMUM |
|---|---|---|---|---|---|---|
| TOUS PART I | 361 | 14.25 | 2.39 | .13 | 18 | 4 |
| TOUS PART II | 361 | 13.23 | 2.17 | .11 | 18 | 4 |
| TOUS PART III | 361 | 16.48 | 3.02 | .16 | 24 | 7 |
| TOUS TOTAL | 361 | 43.96 | 6.14 | .32 | 60 | 17 |
| YEARS OF EXPERIENCE | 382 | 9.46 | 9.49 | .49 | 43 | 0 |
| AGE | 382 | 35.60 | 10.97 | .56 | 68 | 21 |
| UNDERGRADUATE SCHOOL: | | | | | | |
| SCIENCE CREDITS | 349 | 44.07 | 19.32 | 1.03 | 118 | 3 |
| EDUCATION CREDITS | 301 | 21.54 | 10.41 | .60 | 62 | 1 |
| MATH CREDITS | 299 | 11.27 | 8.56 | .50 | 51 | 2 |
| SCIENCE AVERAGE | 349 | 2.61 | .62 | .03 | 4.00 | .71 |
| EDUCATION AVERAGE | 301 | 2.90 | .52 | .03 | 4.00 | 1.65 |
| MATH AVERAGE | 299 | 2.31 | .91 | .05 | 4.00 | .00 |
| GRADUATE SCHOOL: | | | | | | |
| SCIENCE CREDITS | 201 | 25.39 | 18.00 | 1.27 | 94 | 2 |
| EDUCATION CREDITS | 210 | 17.90 | 13.66 | .94 | 87 | 1 |
| MATH CREDITS | 58 | 6.57 | 4.05 | .53 | 19 | 3 |
| SCIENCE AVERAGE | 201 | 3.23 | .56 | .04 | 4.00 | .67 |
| EDUCATION AVERAGE | 210 | 3.27 | .46 | .03 | 4.00 | 1.67 |
| MATH AVERAGE | 58 | 2.93 | .97 | .13 | 4.00 | .00 |

DESCRIPTIVE DATA CLASSIFIED BY SEX OF TEACHER, LEVEL OF TEACHING, AND HIGHEST LEVEL OF EDUCATION FOR DELAWARE SCIENCE TEACHERS (N=382). AVERAGE CREDITS ARE BASED UPON THE TOTAL NUMBER OF TRANSCRIPTS ON FILE FOR EACH CLASSIFICATION

| SAMPLE | TOUS | EXP. | AGE | UNDERGRADUATE SCI. CR. | UNDERGRADUATE EDUC. CR. | UNDERGRADUATE MATH CR. | UNDERGRADUATE SCI. AVG. | UNDERGRADUATE EDUC. AVG. | UNDERGRADUATE MATH AVG. | GRADUATE SCI. CR. | GRADUATE EDUC. CR. | GRADUATE MATH CR. | GRADUATE SCI. AVG. | GRADUATE EDUC. AVG. | GRADUATE MATH AVG. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MEN (276) | 44.10 | 9.71 | 35.98 | 42.35 (N=255) | 19.58 | 10.18 | 2.55 | 2.85 | 2.25 | 22.58 (N=174) | 16.44 | 1.82 | 3.21 | 3.22 | 2.87 |
| WOMEN (106) | 43.58 | 8.80 | 34.61 | 47.73 (N=96) | 15.55 | 8.06 | 2.75 | 3.07 | 2.54 | 18.34 (N=64) | 14.03 | 1.02 | 3.31 | 3.46 | 3.20 |
| HIGH SCHOOL (184) | 45.43 | 10.15 | 36.50 | 46.84 (N=170) | 16.87 | 11.49 | 2.68 | 2.93 | 2.39 | 22.61 (N=123) | 15.75 | 1.93 | 3.25 | 3.31 | 3.04 |
| JUNIOR HIGH (198) | 42.57 | 8.82 | 34.76 | 40.98 (N=181) | 19.99 | 7.83 | 2.54 | 2.88 | 2.21 | 20.19 (N=115) | 15.83 | 1.24 | 3.20 | 3.24 | 2.74 |
| BA (119) | 42.56 | 4.64 | 29.19 | 45.12 (N=113) | 19.57 | 9.69 | 2.47 | 2.89 | 2.10 | | | | | | |
| BA PLUS ( 95) | 42.67 | 11.34 | 38.12 | 40.52 (N=81) | 18.31 | 8.51 | 2.58 | 2.87 | 2.24 | 12.51 | 11.60 | .80 | 3.07 | 3.19 | 2.60 |
| MA (152) | 45.54 | 11.76 | 38.43 | 44.17 (N=143) | 17.81 | 10.18 | 2.74 | 2.92 | 2.50 | 25.74 | 17.98 | 1.96 | 3.30 | 3.30 | 3.07 |
| MA PLUS ( 13) | 47.17 | 15.00 | 44.08 | 46.64 (N=11) | 22.27 | 7.36 | 2.45 | 3.00 | 2.30 | 22.55 | 18.64 | 3.00 | 3.29 | 3.28 | 2.53 |
| PHD ( 3) | 44.00 | .67 | 29.67 | 56.67 (N=3) | ----- | 16.67 | 2.95 | ---- | 3.36 | 53.67 | 14.00 | 3.00 | 3.58 | 3.74 | 3.00 |
| TOTAL (382) | 43.96 | 9.46 | 35.60 | 43.82 (N=351) | 18.48 | 9.60 | 2.61 | 2.90 | 2.31 | 21.44 (N=238) | 15.79 | 1.60 | 3.23 | 3.28 | 2.93 |

COMPARISON OF TEACHING STRATEGIES USED IN SECONDARY SCIENCE CLASSES



## PARTICIPANT COSTS

Sources of funds, numbers of participants, man-hours, and cost per man-hour for each project. Data for all participants, and data for those participants ("appropriate") who teach science in Delaware schools are included. Of the 53 miscellaneous participants, it should be noted that many are Delaware teachers in disciplines other than science.

| Proj. No. | Funding: NSF | du Pont | Local | Total | Participants: "Appropriate" | Misc. | Total | Total Man-hours | Cost Per Man-hour | "Appropriate" Man-hours | Cost Per Man-hour | Efficiency |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70-1 | $23,493 | $20,000 | $ | $43,493 | 65 | 0 | 65 | 5850 | $7.43 | 5850 | $ 7.43 | 100% |
| 71-1 | 11,614 | 19,200 | | 30,814 | 27 | 9 | 36 | 3240 | 9.51 | 2430 | 12.68 | 75% |
| 71-2 | 11,040 | 17,500 | | 28,540 | 9 | 21 | 30 | 7200 | 3.96 | 2160 | 13.21 | 30% |
| 71-3 | 7,935 | 12,600 | | 20,535 | 12 | 6 | 18 | 2880 | 7.13 | 1920 | 10.70 | 67% |
| 71-4 | 1,600 | | 1,600 | 3,200 | 9 | 3 | 12 | 720 | 4.44 | 540 | 5.93 | 75% |
| 71-5 | | 7,500 | | 7,500 | 15 | 0 | 15 | 840 | 8.93 | 840 | 8.93 | 100% |
| 71-6 | 2,000 | | | 2,000 | 26 | 3 | 29 | 1087 | 1.83 | 975 | 2.05 | 90% |
| 71-7 | 20,425 | | | 20,425 | 60 | 0 | 60 | 5400 | 3.78 | 5400 | 3.78 | 100% |
| 71-8 | 22,425 | 25,000 | | 47,425 | 63 | 0 | 63 | 5670 | 8.36 | 5670 | 8.36 | 100% |
| 71-9 | 1,000 | | | 1,000 | 32 | 0 | 32 | 256 | 3.91 | 256 | 3.91 | 100% |
| 71-10 | 1,500 | | 1,000 | 2,500 | 2 | 1 | 3 | 450 | 5.56 | 300 | 8.33 | 67% |
| 71-11 | 1,000 | | 1,000 | 2,000 | 21 | 1 | 22 | 638 | 3.13 | 609 | 3.28 | 95% |
| 71-12 | 1,000 | | | 1,000 | 11 | 0 | 11 | 385 | 2.60 | 385 | 2.60 | 100% |
| 71-13 | 1,000 | | 1,000 | 2,000 | 11 | 0 | 11 | 660 | 3.03 | 660 | 3.03 | 100% |
| 71-14 | 1,500 | | 6,500 | 8,000 | 42 | 0 | 42 | 920 | 8.70 | 920 | 8.70 | 100% |
| 71-15 | 13,488 | | | 13,488 | 27 | 4 | 31 | 2325 | 5.80 | 2025 | 6.66 | 87% |
| 71-16 | 24,363 | | | 24,363 | 0 | 5 | 5 | 375 | 64.97 | 0 | 0.00 | 0% |
| TOTALS | $145,383 | $101,800 | $11,100 | $258,283 | 432 | 53 | *485 | 38896 | $6.64 | 30940 | $8.35 | 80% |

* Actually, there were 429 participants, several of whom have benefited from more than one project. The total 485 refers to the number of participations.

Revised 12/20/71

UNIVERSITY OF DELAWARE
NEWARK, DELAWARE
19711

DEL MOD SYSTEM
015 WILLARD HALL EDUCATION BUILDING
PHONE: 302-738-1230

Student Feedback Summary
Spring, 1972
Science Resource Center

Circle Session
I II

Now that you have had the opportunity to use the Science Resource Center in conjunction with Ed. 373, Elementary School Science, what changes would you recommend in relation to: (use the reverse side if necessary)

(1) Operating Policies:

(2) Physical Facilities:

Future plans may have the Science Resource Center moving to the ground floor in the Education Building. What suggestions do you have for the facilities if this move occurs?

Next year, 1972-73, the science methods course will be conducted entirely in the respective elementary schools. Considering the new 1972-73 schedule, what suggestions do you have for the Science Resource Center? (All methods classes will meet mornings in elementary schools)

How many times did you visit the Science Resource Center (outside of actual class meetings)?

Approximately how much total time did you spend in the Science Resource Center (excluding actual class meetings)?

Were there ever occasions when you visited the Science Resource Center but the person on duty was unavailable and subsequently, you were not able to "sign in"? If so, approximately how many times?

Additional Comments:

RESOURCE CENTER EVALUATION

Summary

Pre-Service Student Feedback

Spring 1972

1. Operating Policies and Procedures

Hours:

| | |
|---|---|
| More | 5 |
| More morning | 4 |
| Later evening | 5 |

Personnel:

| | |
|---|---|
| List of personnel at what hours | 5 |
| One to help students organize experiments | 5 |

Organization:

| | |
|---|---|
| Better cataloging | 9 |
| A reserve system | 1 |
| Orientation tour | 1 |
| Longer sign-out period | 1 |

2. Physical Facilities

| | |
|---|---|
| Larger area | 3 |
| More equipment & resource material (acid-base material) | 7 |
| More use of SAPA materials inside the individual boxes | |
| More films, filmstrips and tapes | |

3. Suggestions for Changes in New Center

1. A place to sit
2. More check-out equipment
3. Have sections labeled -- students to find own material
4. More resources 4
5. More personnel 3
6. Longer hours
   - Night 5
   - Before School 3
7. A library of text and reference materials
8. A separate equipment room
9. Try to coordinate materials with elementary schools
10. Slide program on usage of materials and what there is available
11. Display areas -- change often -- include use of A-V materials
12. Special meetings to teach use of SAPA's materials
13. Send materials to elementary schools

4. Times Visited

| No. of visits | No. of students |
|---|---|
| 1 | 1 |
| 2 | 3 |
| 3 | 2 |
| 4 | 3 |
| 5 | 2 |
| 6 | 3 |
| 7 | 4 |
| 10 | 2 |
| 20 | 1 |
| 20 - 25 | 1 |

5. Hours spent in Resource Center

| Hours in Center | No. of students |
|---|---|
| 1/2 | 2 |
| 3/4 | 1 |
| 1 | 3 |
| 1-1/2 | 1 |
| 2 | 4 |
| 2-1/2 | 2 |
| 3 | 4 |
| 4 | 2 |
| 5 | 1 |
| 7 | 1 |
| 10 | 1 |

6. Twenty students reported the staff was not available for conferences or assistance during their visits.

VISITOR EVALUATION FORMS

RESOURCE CENTER

What do you like about the Center?

How could we best serve you in the field of Education?

SELF-INSTRUCTION AUDIO VISUAL EQUIPMENT LABORATORY

What do you like best about the laboratory?

How could the laboratory serve you better?

2/1/72

RESOURCE CENTER

VISITORS' EVALUATION COMMENTS

1971-2

RESOURCE CENTER

What do you like about the Resource Center?

The helpfulness of the personnel, the lack of rigid pointless policy and red tape. The availability of rooms.

The practical experience that can be obtained through use of the various materials.

Reference copies of texts.

There are a lot of helpful resources available. Also John was helpful in finding different types of materials and activities.

I liked the center because it contained a variety of resources and various materials which were very helpful. I was especially pleased with the help that John gave me, without his guidance I would have been lost. He was more than willing to help with problems.

John Herrmann is extremely helpful and the resource center has a great deal of equipment and ideas for science experiments.

Center has a lot of material available and John in extremely helpful to the student.

You can borrow pieces of equipment and books and get an idea of what is included in different science programs.

Merely that it exists much better help and more able to give the sort of things we need, made with the course in mind.

I especially like looking around and I would also like to use the SAPA material.

Judging from what I seen I think it meets a long time need. I liked idea of being able to have everything that is needed for a demonstration at hand.

Merely that it exists - much better help and more able to give the sort of things we need. Made with the course in mind.

I was able to check out materials for use in my school - which is a school in a low-income area with little equipment. My students loved it.

The materials located here.

Service and equipment.

Well supplied, limit lending schedule

It's great to be able to go to center and get practically all the equipment we need for experiments - also, the collection of books has been helpful. The center has really been a life saver - and foot saver.

It has been very helpful in our teaching. All the materials we've needed has been available and checked out with no problem what so ever. We've done a lot of experiments and could not have gotten all the materials on our own.

Very well organized - suits my needs beautifully.

All the individual rooms provide good study and test centers without disturbance.

It has a great number of ideas and materials particularly helpful to the novice science teacher!

How could we best serve you in the field of Education?

Continue to loan materials. Help with ideas to set up a science program for different ages - 2nd grade in my case.

Stay the same!

Could we sign out a film loop for the SRA Inquiry Development Program - to use in a classroom session (Elementary School) and return it the same day? I'd like to borrow the Stalled Car for just one day.

Long hours during summer for those who are still teaching during the summer.

Continuing to keep equipment used in education science programs. Such as AAAS or ESS.

Materials available to be checked out- perhaps with low-cost rental fees to cover breakage and general use.

Maybe have more projects available and have a larger film library and make films available to students.

Through the implementing of more experiments and demonstrations in the field of science.

Get more reference copies of texts.

Have a larger amount of resources (# of copies) available.

Continue with the resource center and people who are very helpful and knowledgeable.

The resource center has books and people that are a great deal of help when trying to organize lessons.

By maintaining a supply of materials and helping prepare experiments, etc.

Give demonstration lessons of how different parts of science programs equipment can be used in the elementary school.

It could best serve me by the use of materials and equipment.

I feel that the experiments should cover a broader field than that is present at the center now. (eg.) more secondary Education exposure especially in chemistry. More films in different science topics should be available. The only films that are available now are on biology and come with the kit. For instance as a student teacher sometimes I may feel that a film would do a good job clarifying a concept. Also more visual aid materials that can be used with the machinery should be available.

AUDIO-VISUAL EQUIPMENT LABORATORY EVALUATION

SUMMARY

1971-2 USER'S COMMENTS

1. What do you like best about the laboratory?

The friendly atmosphere, and friendly assistance and instruction.

I like the idea of you working at your own speed and being tested when you are ready. Also you get to operate the machines yourself.

I like the idea of proceeding at your own pace, not having an assistant at your back.

I liked being able to handle the equipment myself, without just having instructions presented or given to me.

It lets you work at your own speed in order to make sure of getting the procedures correct.

Everything was well ordered, and evidence that is was very well constructed is clear.

Programmed type instruction is excellent, very easy to follow. Staff every cooperative and helpful.

It was a good way to get some hands on experience without having to wait until you're in front of a class to try to learn.

Programmed instruction facilitates more thorough learning of A-V equipment. Personnel friendly and very helpful. Rarely crowded. Provided opportunity to learn a number of A-V aids I might not have run across i.e. video recorder.

Working at my own speed, whether fast or slow and making sure I know how to use the equipment.

I like best the fact that the A-V instructors are always so pleasant and helpful (even to people as unmechanical and clumsy as me!). . .

Self-instruction aspect. Since I was unfamiliar with the equipment, it helped to work at my own speed.

I liked working with the machines and the proctor was very helpful - (the tutorial slides-allowed you to go at your own rate).

You are able to go at your own speed and experience every facet of operation.

The opportunity to actually use the equipment.

Could work at own rate. Got to work all machines by self.

I feel that it gives you the opportunity to see what is available in schools - how to work the machines, etc. In this way I feel I will now be able to use them much better when teaching.

Relaxon atmospons conveyor on the part of the staff.

I learned to work projectors, which I did not know.

Knowing how to work movie projectors (and slide projectors) so I can do it by myself at home.

I think the lab is well set-up. Instructions are explicit and proctors were helpful.

I liked the fact that you went at your own rate of speed. I am really glad that I learned how to operate the B & H Projector the others I think (probably with alot of fumbling) could be figured out by themselves if it was necessary.

I like the self-instruction equipment where you can work at your own speed. Also the instructors are very helpful.

The possibility to teach yourself with assistance if you need it, and the variety of equipment available for instruction.

Everybody was very helpful and I did learn how to use some of the equipment that I didn't know before.

Being able to operate the equipment myself. A guide to explain.

Self-instruction aspect -- progressing at own rate.

The fact that the slides let you go at your own rate.

Ease with which slides let you go at your own rate.

I like the opportunity to be embarrassed here and learn now, rather than blowing it in the classroom. All in all, very well conducted.

I liked learning how to work Bell & Howell and tape recorder.

Self-teaching.

I think it is good for it gave you a chance to run the different audio visual equipment, and learn how to use them properly. To me this will be a great aid as I go into teaching.

I like the laboratory as a whole, because it gives me a great opportunity to learn how to use such media, that I will be teaching in the future. There was no one aspect I could point out, but just having the opportunity I mentioned.

I liked the equipment. It was the type equipment we would use in everyday teaching. The location is nice because it is easy to get to between classes and the hours are good.

That it gives you a chance to learn how to work and operate the equipment on your own. It gives you a good guide thru the operations of the machines.

Many of the projectors are very valuable to learn to operate. Also the self instruction is good in that the instructor will help correct your mistakes and helps you learn much more.

The equipment we learned. I feel will be very useful in future teaching.

There is not an over amount of pressure when you are using equipment. Self-tutorial is excellent technique for learning.

The fact that I could do the work on my free time.

I like the self-instruction and separate booths. There is no stress on time limit.

Being able to get some experience on the equipment available.

I liked being able to work at my own speed, so as to be tested when I felt I was ready, and not feeling like I was rushed to get done.

The fact that you can learn individually at your own speed.

Viewlex.

Chance to handle and use the machines at my own speed-which is slow. Good variety of machines.

The variety of equipment provided and the help given during the learning session.

The instructors were very helpful to help me learn all that I needed to know about each instrument.

You can work at your own pace.

The technician's a good guy.

The Carousel instructions were excellent, the people aiding were also excellent.

Learning how to use all the equipment.

The opportunity to learn to operate the equipment at your own rate of speed.

The fact that I can go through it individually. The helpfulness of instructors.

The fact that I'm finished! I always wanted to know how to run a movie projector. Now I won't have to be afraid to show movies etc. all the time. 'cause I'll know how to use everything.

It gives you a one to one relationship. You get great experience before you go to the classroom.

Can learn at your own pace. Can work directly with the equipment and familiarize yourself with the machines before using them in the classroom. Always someone there to answer your questions.

It's great - learned a lot in a minimum amount of time and it's fun !

The instructors are very helpful and congenial.

You can practice on the equipment as long as you want. People help you clarify items that are not clear on slides.

The service is good. The instructors are helpful. The audio-visual instruction is clear and easily understandable.

Whenever I came the Lab only had a few people and so the instructor could answer questions. Many times she patiently explained things that I was confused about.

Learn to use equipment that will be needed in teaching.

It's a relief to be done. Every teacher should know this stuff.

(1) the self-pacing that is possible through the use of the Carousel projectors. (2) The slides in the Carousel projectors which instruct us (on how to operate the machines) move in a series of small related steps. The steps cover only 1 aspect of the machine operations (or maybe 2)

The opportunity to actually use the equipment.

It's a great place to learn about A-V equipment. Gives the prospective teacher a chance to practice necessary things.

I think the programmed instruction using the carousel is great! The instructors were very helpful.

You can run through the equipment at your own speed and there is someone around to answer questions.

The aids are very helpful and patient and the instructions were very well done and easily understood.

The number of the kinds of equipment and the self-tutorial aspect.

Materials and helpful instruction.

Meetings of new people. I like to learn the equipment once I do it but it's a pain in the neck to have to come up here and take the time to do it especially when I have units and lesson plans!

Finally being able to work all movie projectors.

The operator - very helpful woman. The variety- good exposure.

The self-teaching technique used.

There is a person working who is willing to help you with problems. It also has modern equipment.

Being able to practice on the equipment on our own rather than just being shown how to use things.

The fact that all kinds of machines are there and the personnel assistance when one gets stuck.

2. How could the laboratory serve you better?

I can't think of any way it could possibly be any better.

I realize that there is a shortage of aids in running this laboratory, but more times available to practice would be a help. At times, the lab got so crowded and hot, it was difficult to be patient to wait for one's turn.

If this thing wasn't required for ED410 I could go through like a breeze. But with me lab instruction, I don't have time to sit around and wait to be checked off. I am too busy to waste this time.

The lab could be open a little more hours to avoid crowding There could be some added information for extra things that could be done with each of the equipment, rather than just learning to operate them.

The laboratory is very helpful now!

More equipment.

1. By having duplicate equipment so more than one person can learn the same thing without waiting in line.
2. By having more than one person helping and testing when it's crowded.
3. By being open Monday through Friday in mornings and afternoon(This would also help create more jobs, yes?)

Being open at a more convenient time --earlier. Also it should be enlarged to facilitate more people.

Better hours, bigger room, Slides could tell us why we do some of these things. Very little cause and effect explanation.

By having more people to supervise and check so that you may move from one station to the next more quickly.

I think a bigger room with possibly another person working would be better. I dislike people being so close to me while I am working.

Put a reasonable time limit on how long one person can occupy a particular piece of equipment at one time -- sometimes somebody will spend a hour or more on one item--which causes a long wait for others.

Looks fine to me the way it is.

It's ok as it is.

It can't. It is good now.

I think the set-up is fine!

Sometimes I felt the instructions on the film could be a little 'etter. Also, there should be a sign telling everyone to put equipment back as if it were being used for the first time.

My only complaint is that the instructional slides were unclear at times.

No other way right now.

I think if we were able to use some of this equipment in class or in our classrooms, it would give us more practice. I think I might have forgotten how to use some of the equipment.

It would be nice to be able to come in at any time and work some of the equipment again, especially if you needed to refresh your memory on any of the equipment.

If there were more evening hours.

It could'nt

I'd like to try a video-tape machine sometime. It has been fine as long as I came in when there were'nt crowds of people. Good instruction.

Have more instructors to meet the needs of each student.

It couldn't serve me better. You should have the whole semester to complete this time rather than one month period for example.

It could be open more.

The use of TV portable equipment should be available.

I think it's very good now.

By being open evenings and weekends.

More hours.

Nicer personnel!!! And more of them. Limit the amount of people who come into here at one time so we don't have to waste half the time waiting.

It is well organized.

Put lab in larger room. It gets very crowded. Have more than one instructor so they do not have to keep a frantic pace and yet can answer your questions quickly.

I can think of no answer to this question. I thought the laboratory on the whole was great.

It would be better if there was audio-visual instruction as well but I realize it may be impractical.

Serves me perfectly, instructor helpful.

Be open more hours.

I don't have any suggestions. It was excellent.

Maybe small instructional booklets (Illus.) would be helpful for future reference. -- They would be handy since forgetting is bound to occur.

It served me with 100% efficiency just the way it was set up.

It could serve me better if there were duplicates of the equipment many times when I came I had to wait or else leave because the room was so crowded.

I thought the whole procedure was fine.

If the laboratory had more stations, it might eliminate some waiting on busy days.

I think the laboratory is doing a great job right now and it would be hard to improve on it.

The only improvement that I can suggest, is more space, that is another room with similar equipment. There were a few days when I didn't get anything done becuase it was crowded. This the only suggestion I have, because everything else seemed to work well, I really will benefit from this experience.

Maybe add more equipment or different makes of the equipment you already have. A larger room would be better also.

Maybe by having more equipment and a way of testing quicker when it is crowded.

If it was open more hours so I could come in and review in case I should need to use these projectors it would be a great help.

Perhaps the directions could be a little clearer. And you need more space.

No suggestions--Except to be open Saturday and evenings too!!

I see no need for any changes.

If you have slides or a film that you personally want to see you could use the equipment.

The lab would be a good brush-up for in-service teachers. As for me, it gave me experience with equipment I'd never seen, nor used.

Be open more.

More personnel.

Increase the amount of time that the Lab is open. Rotate the time that various classes use the lab. It is rediculous that both Ed 410 and Ed 371 (a total of approximately 350 students) are required to go through the lab. This might cut down on the terrible crowded and mobbed lab.

If there were more regulation or more people to check during the times when it is crowded. A few times people have had to wait all afternoon to use a particular piece of equipment.

Many more machines, more hours.

The hours were quite insufficient for learning and testing on the instruments. Also, the small room and one piece of equipment for each table hindered many people from doing their best.

It is an efficient operation with very little improvement necessary in the technical aspects.

It was quite sufficient.

I would have liked it to be open in the morning at least one day a week. But besides that it was fine.

If the facilities were enlarged to allow 2 of each piece of equipment, it would ease up the traffic jams that occasionally occured. Also, if the lab were open more hours per week, it would alleviate the situation somewhat. I question how long the abilities acquired here will be retained after only using the equipment once or twice.

As of now, the laboratory serves me very well.

I was served quite well and have no complaints.

More hours during regular school days.

Have a period in the morning to use lab.

By having us use it freshman year.

More people to check at peak times.

Served me well enough.

Get more assistants to aid the large number of students required to learn the equipment.

More assistants or faster testing. Overall very useful.

VI. How program contributes to the improvement of teacher education.

The initial impact of Del Mod on teacher education programs in Delaware is found in the new cooperative relationships among the component institutions. Colleges are planning joint programs modeled after the Del Mod System. A new state-wide vocational teacher training program is coordinated by the same Council of Presidents. Similar programs planned for pre-school teachers and drug education have been implemented.

A second program impact can be found within the University. Feedback from the Field Agents, Research Director and faculty is used to modify specific course activities. Dr. C. W. Knight uses the Study Guide developed in cooperation with Dr. Uffelman to individualize a portion of the curriculum and methods courses for undergraduates and for graduate students who do not possess these competencies. Dr. David Yens developed an independent study module to introduce computer programming to more students. The Self Instructional Audio-Visual Equipment Laboratory program teaches pre and inservice teachers how to operate modern media equipment. It is supervised by students with special training and requires minimal faculty direction. The individual study-testing programs in Special Education, research and evaluation procedures, and in the humanistic foundations of Education contribute to freeing faculty members from routine tasks so they have more time for individual contacts with students.

Experienced teachers in the schools also contribute to improving teacher preparation. For example, Mr. Robert Lewis developed and introduced a teacher manual for the Geology of Delaware Coastal Environments. Localized teaching materials that have been examined for accuracy by competent scholars are difficult to obtain. This project conducted in cooperation with Dr. J. C. Kraft, Geology Department, provided impetus to prepare similar materials. Another teachr, Mr. Winston Cleland, developed physical science workshop materials for elementary teachers.

The University's program thrust toward competency-based teacher education is supported with expansion of the Resource Center and with the studies conducted by Del Mod Fellows. They are assessing teacher acceptance of objectives to be used in planning performance-based modularized instruction. The facilities of the Center are being adapted to fit this new mode of teacher education.

New degree programs for the Bachelor of Science in Secondary education and the Masters in Natural Science indicate another impact of the Del Mod System. These plans include field experiences for both pre-service and inservice teachers. The degrees also encourage individually planned programs rather than the conventional lock-step course requirements.

Delaware State College reports that new faculty are employed who possess particular strength in teacher education. New courses have been developed such as Physical Science for middle school

teachers. A new Education Building is being constructed. Del Mod cannot claim credit for the building, but a Resource Center modeled after Del Mod Centers is included in the structure.

Delaware Technical and Community College offers a two-year education technician program. These students are trained to assist classroom teachers. This program was initiated as a result of the Del Mod System. The students receive some training at Delaware State College, in the Audio Visual laboratory of the University Resource Center, and in the public school field experiences. This activity enhances cooperation among the institutions.

The State Department of Public Instruction offers inservice credit to teachers who participate in approved activities. Several Del Mod projects contribute specifically to improving these teacher education activities. Resource personnel trained by the institutions develop workshops that both meet locally identified needs and offer improved instruction with multi-media materials.

The Del Mod System provides a spark of enthusiasm for improvement of the teacher education programs throughout Delaware. It is a focal point for college faculty, school teachers, educational administrators, local industry and government funding agencies to develop other models for the general improvement of education at all levels. It is a distinguished achievement in teacher education.